Range Sum Query Done

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Background

Have you ever seen this question?

Source: Hong Kong Mathematics Olympiad 1988-89 Heat Event (Group) Question 3

It is known that $1^2 + 2^2 + \cdots + n^2 = \dfrac{n(n+1)(2n+1)}{6}$ for all positive integers n. Find the value of $21^2 + 22^2 + \cdots + 30^2$.

Observation:
The given formula starts with 1^2 but the expression starts with 21^2. What can you do?
- Possible Method 1: Ignore the given formula and add numbers in succession.
- Possible Method 2: Find the general formula (in terms of n) for $21^2 + 22^2 + \cdots + n^2$ for all integers $n \geq 21$?
- Possible Method 3: Put some numbers into the given formula to find the desired value. *How?*

Solution: (using method 3)

$$
\begin{aligned}
21^2 + 22^2 + \cdots + 30^2 &= (1^2 + 2^2 + \cdots + 30^2) - (1^2 + 2^2 + \cdots + 20^2) \\
&= \frac{30(30+1)(2(30)+1)}{6} - \frac{20(20+1)(2(20)+1)}{6} \\
&= 9455 - 2870 \\
&= 6585
\end{aligned}
$$

Property

For any integers i and j with $i \leq j$,

$$A_i + A_{i+1} + \cdots + A_j = (A_1 + A_2 + \cdots + A_j) - (A_1 + A_2 + \cdots + A_{i-1})$$

Task Description

You are given N integers, they are $A_1, A_2, ..., A_N$.

You have to answer Q independent queries.
For each query, output the sum of all integers between the Lth and the Rth elements (inclusive) with $L \leq R$.

Input Specification

The first line of the input contains exactly 2 positive integers N and Q.

The next line contains exactly N integers — $A_1, A_2, ..., A_N$.

The next Q lines contain queries. The ith query is given as two integers L_i and R_i.

Output Specification

The output contains exactly Q lines.
The ith line contains the answer to the ith query, i.e. $A_{L_i} + A_{L_i+1} + \cdots + A_{R_i}$.

Sample Tests

Input	Output
6 4 1 4 9 16 25 36 1 6 2 4 4 5 6 6	91 29 41 36

Explanation:

There are 4 queries in total.
- The 1st query: $A_1 + A_2 + \cdots + A_6 = 1 + 4 + 9 + 16 + 25 + 36 = 91$.
- The 2nd query: $A_2 + A_3 + A_4 = 4 + 9 + 16 = 29$.
- The 3rd query: $A_4 + A_5 = 16 + 25 = 41$.
- The 4th query: $A_6 = 36$.

Constraints

There are 5 test cases in this task.

For all test cases:
- $1 \le N, Q \le 20000$
- $-100000 \le A_i \le 100000$
- $1 \le L_i \le R_i \le N$

For 20% of the test cases: (Test case #1)
- $L_i = R_i$ for all Q queries

For another 40% of the test cases: (Test case #2 ~ #3)
- $1 \le N \times Q \le 200000$

Hints: Prefix Sum Array

You may construct a [prefix sum](#) array first. The ith element of the prefix sum array is defined by $A_1 + A_2 + \cdots + A_i$.